Using Latent Semantic Analysis to Identify Quality in Use (QU) Indicators from User Reviews

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ABSTRACT

The paper describes a novel approach to categorize users' reviews according to the three *Quality in Use* (QU) indicators defined in ISO: effectiveness, efficiency and freedom from risk. With the tremendous amount of reviews published each day, there is a need to automatically summarize user reviews to inform us if any of the software able to meet requirement of a company according to the quality requirements. We implemented the method of Latent Semantic Analysis (LSA) and its subspace to predict QU indicators. We build a reduced dimensionality universal semantic space from Information System journals and Amazon reviews. Next, we projected set of indicators' measurement scales into the universal semantic space and represent them as subspace. In the subspace, we can map similar measurement scales to the unseen reviews and predict the QU indicators. Our preliminary study able to obtain the average of F-measure, 0.3627.

KEYWORDS

quality in use, Latent Semantic Analysis, intelligent information system, reviews, data mining

1 INTRODUCTION

There are various ways human could express their feelings and emotions: speech, text, gesture, facial expression and so on. Due to the advance in Internet technology, they write reviews at online websites such as Amazon and CNet after they used certain products and services. Thus, Internet becomes a medium in communicating with other people of similar interest. Reviews give huge impacts on business and social field. For business, a business company able to know how end users feel for their products from social perspective: the reviews actually can influence other people's decisions and opinions regarding certain product.

The *Quality in Use* (QU) model by International Standard Organization (ISO) is the validated measured method to measure the quality of software or products which related to the outcome after user interacted with the products [2]. The indicators for QU model are effectiveness, efficiency and freedom from risk, satisfaction and context coverage [2]. According to Atoum and Bong, the reason that drives users to use a product is if the product is perceived able to achieve particular goals such as effectiveness and efficiency [1]. In this study, we intend to automatically reveal the indicators from a pool of software reviews without human intervention. These indicators are important as they are the key decision factors to be taken into a consideration before a company purchase and adopt particular software.

As the Internet and social media thrive, the vigorous rate of increasing number of user generated reviews or related text have made the analyzing task become tedious and difficult. In addition to the incongruent context such as emotion and personal preference, the process is further complicated with the different interpretation of ambiguous word expressed by different individuals.

In this paper, we investigate a computational way to help in assimilating the mountainous reviews into useful information to allow one to

make decision. We get QU indicators' related behavioral variables and use their respective measurement scales to indicate the existence of QU indicators in reviews. We assume that when we able to relate similar measurement items to the reviews, we can infer their QU indicators.

2 PROBLEMS

Users write reviews to express their feelings and communicate with others after they used a certain product. Most of the text mining methods on user reviews are based on feature to determine the polarity (positive, neutral or negative). There are other information that can be revealed from the reviews such as the QU indicators, which determined if ICT products able to help to achieve an organization's goals. Furthermore, interpreting reviews by human can cause bias and confusion as each of us have our own distinct interpretations. Thus, interpreting reviews sometime are subjectively depended on individual context. With this, we desire an approach to detect QU indicator from reviews without introducing bias.

3 RESEARCH GOAL

This study is to propose an approach to detect the three QU indicators expressed by users in reviews: effectiveness, efficiency and freedom from risk of the products. These are the characteristics from international standard to measure the quality of product.

4 BACKGROUND

Personal satisfaction, success of business and human safety are depended on high quality software and system [2]. It is important that product quality characteristics can be measured based on validated measurement methods according to International Standard derived from ISO/IEC 9126:1991. This international standard defines a QU model that composed of five characteristics that about "the outcome of interaction when a product is used in a particular context of use" [2]. QU model is a model that represent "the degree to which a product or system can be used by specific users to meet their needs to achieve specific goals" [2]. Examples of the goals are *effectiveness, efficiency, freedom from risk* and *satisfaction*.

For the sake of brevity, in this study, we are focusing on three characteristics: *effectiveness, efficiency* and *freedom from risk* as QU indicators. The definitions for the three chosen QU indicators according to ISO 9241-11 [2] are given in Table 1.

Table 1. Definitions of QU indicators according to [2]

QU Indicators	**Definitions**
Effectiveness	*accuracy and completeness with which users achieve specified goals*
Efficiency	*resources expended in relation to the accuracy and completeness with which users achieve goals*
Freedom from risk	*degree to which a product or system mitigates the potential risk to economic status, human life, health, or the environment*

As the formal definition of the three QU indicators from ISO document is rather brief, we reinforced the indicators with expert validated measurement scales from Human Behavioral Project [4]. The examples of the measuring scales for each indicator are shown in Table 2.

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